

Table 1.D
Problems that Occur when AC Power is Applied

No.	Problem	Probable Cause	Possible Solutions
1	Display does not illuminate and drive and motor cooling fans do not start.	Loss of incoming AC power.	Measure AC voltage between terminals R, S, and T on the bottom of the drive to verify that the line to line voltage is 180-253V AC at 60 Hz or 180-242V AC at 50 Hz.
		Loose power connection in Power Unit.	Check and tighten screws that connect the Power Board to the power terminal block. Check for other loose screws or connectors in Power Unit.
2	Drive and motor cooling fans do not start.	Malfunctioning AC control power fuse.	Check fuses FU2R, FU2S, and (on A22 only) FU2T and replace malfunctioning fuse.
		Loose or disconnected fan wiring.	1. Verify that drive cooling fan cables are plugged into Power Board. 2. Verify that motor cooling fan is properly wired to drive and motor terminal blocks
3	Drive programming / diagnostics display does not illuminate.	Malfunctioning AC control power fuse or +5V DC power supply fuse.	1. Check fuses FU1R and FU1S and replace malfunctioning fuse.
			2. Check 5V DC power supply fuse F7 (or F13 on A04/A06 size unit) and replace malfunctioning fuse.
		Display intensity or contrast is misadjusted.	Intensity and contrast adjustment pots are directly below the display on the I/O Board (below and right on A04/A06 size unit). Turn CCW to increase intensity and contrast.
		Logic power supply has malfunctioned.	Measure voltage at +5V DC test point to verify proper power supply operation. If no +5V DC, remove AC power and then remove cover from board connector CN8 (CN15 on A04/A06 drive). Reapply AC power and using a voltmeter, verify voltage between pins 3 and 4 (pins 1 and 32 on A04/A06 drive) is 255-355V DC. If supply voltage is OK, replace Main Control Board (or Gate Drive Board on A04/A06 drive). If no 255-355V DC, verify Interconnect Boards are properly seated in connectors. Inspect contacts in both connectors to assure that they are making proper contact with the Interconnect Boards. Replace drive Power Unit if 255-355V DC can not be obtained.
		Display has malfunctioned.	Replace I/O Board and display assembly.

Table 1.D (Continued)
Problems that Occur when AC Power is Applied

No.	Problem	Probable Cause	Possible Solutions
4	AC Phase Loss displayed - Loss of one phase of incoming AC line detected by drive	An incoming 3 phase line is open.	Measure all phase to phase voltages. Check all incoming line connections for tightness.
		Malfunctioning AC control power fuse.	Check fuses FU3R, FU3S, and FU3T.
		Malfunctioning drive interconnections or hardware.	1. Check seating of Interconnect Board into board connector CN8 (CN16 on A04/A06 drives). 2. Remove Interconnect Board from CN8 and inspect contacts in both connectors to assure that they are making proper contact with the Interconnect Board. Make certain it is plugged back in correctly, so that "blank side," if any, is towards outside of drive. 3. Remove Control Boards and check tightness of incoming power connections to Power Board. Check for other loose power interconnects.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board on A04/A06 drive).
		Faulty Power Unit.	If problems were not found with other tests, replace main Power Unit.
5	Power Supply displayed - An internal power is missing or out of tolerance was detected.	Low voltage power supply malfunction.	1. Check +5V test point on Main Control Board. Should be +4.75V to +5.25V. (Note: test point is before the 5.0A fuse in the circuit). 2. Check +15V test point on Main Control Board. Should be +14.25V to +15.75V. 3. Check -15V test point on Main Control Board. Should be -14.25V to -15.75V. 4. If any voltages are out of tolerance or missing, replace Main Control Board (Gate Drive Board on A04/A06 drive).
6	Resolver Loss displayed - Improper or no signals from motor resolver have been detected.	Incorrect wiring to resolver.	1. Verify that the resolver feedback cable is plugged into connector CN3. 2. Verify that the resolver connector in the motor terminal box is properly inserted. 3. Check each connector to verify that it is wired according to the 8510 User Manual.

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Resolver waveforms not correct.

1. On Main Control Board (Gate Drive Board on A04/A06 drives), check test points S1 and S2 for excitation sine waves (these will not be smooth, but will have a staircase look). See Figure 1.3 for typical resolver waveforms. If waveforms are not correct, then unplug the resolver cable connector, CN3. If the waveforms are now correct then the resolver cable is miswired or the resolver is malfunctioning. If the waveforms are still not correct, replace the Main Control Board (or Gate Drive Board).
2. Check test point R1 for a smooth, clean feedback sine wave. See Figure 1.3 for typical waveform. If R1 waveform correct, replace Main Control Board (or Gate Drive Board)
3. If R1 waveform is missing or incorrect, check resolver wiring. If wiring OK, replace motor/resolver.

Table 1.E
Problems That Occur when Drive Enable is Applied (or during operation)

No.	Problem	Probable Cause	Possible Solutions
7	No fault is indicated but the main contactor will not close and the Drive Ready output is not energized.	Improper command sequence has been applied.	Assure that the Coast to Stop input is energized before any other input command is applied. Assure that Drive Enable is energized before either run command or the orient command.
		Contactors coil circuit not completed via the Coast to Stop input.	Assure that the jumper cable is connected between connector J3 in the lower left corner of the I/O Board and the EM1-EM2 terminal block on the upper left of the power circuit board.
		Loose connections on contactor.	Remove control boards and tighten all connections to main contactor.
		Malfunctioning pilot relay on I/O Board.	Remove power. Remove the jumper cable from connector J3 on the I/O Board. Use a small piece of insulated wire to short between the terminals of the plug on the jumper cable. Important: 230V AC is present on this plug when AC power is applied. If the contactor will now close when power is turned On and the Drive Enable is applied, replace I/O Board.
		Malfunctioning pilot relay on Power Board or malfunctioning contactor.	If problems were not found with other tests, replace Power Unit.

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8	No Precharge displayed - the DC bus failed to achieve the necessary voltage level during the allowed bus precharge time and the main contactor is blocked from closing.	AC line voltage out of tolerance.	Verify that AC line voltage is between 180-252V AC.
		Malfunctioning drive interconnections	<ol style="list-style-type: none">1. Check seating of Interconnect Board into board connectors CN6 and CN7 (CN14 on A04/A06 drives).2. Remove Interconnect Board from CN6 and CN7 (CN14) and inspect contacts in both connectors to assure that they are making proper contact with the Interconnect Board. Make certain it is inserted correctly, so that “blank side,” if any, is towards outside of drive.3. Remove Control Boards and check for any loose hardware on Power Board. In particular, check connections to the terminal block, AC line inductor, and IGBT modules M4, M5, and M6 (or IGBT2 in A04/A06 drive).
		Malfunctioning IGBT module in converter bridge.	Check IGBT modules M4, M5, and M6 (or IGBT2 in A04/A06 drive) according to the “IGBT Test Procedure” presented later in this chapter. Replace Power Unit if IGBT is malfunctioning.
		Malfunctioning bus precharge KM1, or bus discharge, KM3, relay.	If problems were not found with other tests, replace Power Unit.
9	Convtr Short displayed - Current sensed by DC link current sensor CT-R was too high Usually indicates problem converter bridge.	Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drive).
		Momentary power outage while motor is regenerating to a stop.	Remove power to the drive, and restart.
		Malfunctioning drive interconnections	<ol style="list-style-type: none">1. Check seating of Interconnect Boards into board connectors CN7 and CN8 (CN15 and CN16 on A04/A06 drives).2. Remove interconnect board from CN7 and CN8 and inspect contacts in both connectors to assure that they are making proper contact with the Interconnect Board. Make certain it is inserted correctly, so that “blank side,” if any, is towards outside of drive.
		Possible blown IGBT driver fuse on Main Control Board (Gate Drive Board on A04/A06 Drive).	Remove all twelve 0.3A fuses and check with ohmmeter. Replace any bad fuses. Important: Be certain to properly reset all fuses to avoid possible damage to IGBTs.
		Malfunctioning IGBT module in converter bridge.	Check IGBT modules M4, M5, and M6 (or IGBT2 in A04/A06 drive) according to procedure provided later in this chapter. Replace Power Unit if IGBT is malfunctioning.

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		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drives).
		Malfunctioning Power Unit current sensor or circuit board.	If problems were not found with other tests, replace Power Unit. sensor or circuit board.
10	Motor Short displayed - Current sensed by motor phase current sensors CT-U or CT-V was too high. Usually indicates a problem with the motor or motor wiring.	Improper connection of winding changeover contactors when a dual winding motor is being used.	Check for proper hookup of contactors, motor, contactor coils, and auxiliary contacts.
		Incorrect motor selected in MOTOR SELECT- Catalog Num parameter.	Check Catalog Num setting to verify that it matches the motor nameplate.
		Shorted or voltage breakdown of motor or motor cabling to ground or another phase.	Disconnect motor at the drive. Use a megger (high voltage ohmmeter) to verify that the insulation resistance to ground for each phase is at least 5 megohm. For dual winding type motors, disconnect the power wires at the motor terminal box and use the megger to measure phase-to-phase insulation resistance. Verify that the insulation resistance between U & V, V & W, and W & U is at least 5 megohms. For single winding motors, use an ohmmeter to measure resistance between phases; depending on motor size, value measured should be from 0.1-1.0 ohms and should be approximately the same between each phase. Phase-to-phase and internal winding shorts may not be detected with this test.
		Improper motor power connections.	Verify that the motor power cable is securely fastened to the drive and motor terminal blocks and that no stray wire strands are shorting out any phases.
		Malfunctioning printed circuit board.	Replace the Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06).
		Malfunctioning Power Unit.	If problems were not found with other tests, replace the Power Unit
11	Inv/Mtr Short displayed - Current sensed by DC link current sensor CT-S was too high. Usually indicates problem with motor or IGBTs in inverter bridge.	See fault condition 10, Motor Short.	See fault condition 10, Motor Short.
		Malfunctioning drive interconnections.	1. Check seating of Interconnect Boards into board connectors CN7 and CN8 (CN15 and CN16 on A04/A06 drives).

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			CN8 and inspect contacts in both connectors to assure that they are making proper contact with the Interconnect Board. Make certain it is inserted correctly, so that “blank side,” if any, is towards outside of drive.
		Possible malfunctioning IGBT driver fuse on Main Control Board (Gate Drive Board on A04/A06 Drive).	Remove all twelve 0.3A fuses and check with ohmmeter. Replace any bad fuses.
			Important: Be certain to properly reseat all fuses to avoid possible damage to IGBTs.
		Malfunctioning IGBT module in inverter bridge.	Check IGBT modules M1, M2, and M3 (or IGBT1 in A04/A06 drive) according to procedure later in this chapter. Replace Power Unit if IGBT is malfunctioning.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drives).
		Malfunctioning Power Unit current sensor or circuit board.	If problems were not found with other tests, replace the Power Unit.
12	Need Parameter displayed - A required parameter programmed into the EEPROM before attempting to enable the drive.	Drive programming not completed.	1. Verify that the motor catalog number and drive catalog number are properly programmed. 2. In orient mode, verify proper feedback definition.
13	Parameter Err displayed - Two programmed parameter values conflict with one another.	Parameters are incorrectly programmed.	Re-examine programmable parameters for compatibility; start with the ones most recently changed. Refer to the 8510 Programming Manual (publication 8510-5.2) as needed.
14	Data Conflict displayed - Programmed parameter values conflict with one another.	Parameters are incorrectly programmed.	Re-examine programmable parameters for compatibility; start with the ones most recently changed. Refer to the 8510 Programming Manual (publication 8510-5.2) as needed.

Table 1.F
Problems that Occur while the Drive is Operating

No.	Problem	Probable Cause	Possible Solutions
15	Motor runs in a random or uncontrolled manner or with excessive vibration when either the Forward Reverse Run command is energized.	Resolver phasing is incorrect. Motor phase is open.	Use the programming parameter ELECT CONFIG - Motor Phasing to reverse the relative phasing of the motor to the resolver. Check all power wiring to the motor for continuity and tight connections. Use an ohmmeter to verify phase to phase continuity for each motor phase. When 1327AD series dual winding motors are used, check both winding change contactors for proper operation.
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		Resolver or resolver wiring is	Refer to fault condition 6 for solutions.

malfunctioning.

16	AbS Overspeed displayed - Motor shaft speed exceeding the programmed value of the Overspd Trip parameter was detected.	MOTOR SELECT - Catalog Num and/or ELECT CONFIG - Drive Cat Num programmed as “NONE SELECTED” when the Coast to Stop input is turned On.	Correctly program the MOTOR SELECT - Catalog Num and ELECT CONFIG - Drive Cat Num parameters before applying 24V DC to the Coast to stop input.
		Overspd Trip parameter set too low relative to commanded speed.	Increase setting of Overspd Trip parameter or reduce setting of Max Cmnd Spd parameter. The overspeed trip point should be set about 10% higher than the maximum command speed to avoid nuisance trips.
			Important: If the Overspd Trip parameter is inadvertently set to zero, this fault may occur as soon as the power is applied to the drive. With a setting of zero, even a one bit change from the resolver decoding circuit will cause this fault
		Motor disconnected from load while drive in torque mode.	Never allow the motor to become disconnected from the load or the drive to be disconnected from an external control loop while the drive is operating in torque mode.
		Excess overhauling load.	Reduce the overhauling load to a value that is less than the torque limit setting of the drive.
17	Bus Overvoltg displayed - DC bus voltage that exceeded maximum allowable limits was detected.	Malfunctioning resolver or resolver signals.	Check the resolver signals as defined under fault condition 6.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drives).
		Incorrect motor selected in MOTOR SELECT- Catalog Num parameter.	Check Catalog Num setting to verify that it matches the motor nameplate.
		Incoming 3 phase voltage is out of tolerance.	Adjust taps on transformer or add step-down transformer to keep AC line voltage below 253V AC, 60 Hz or 242V AC, 50 Hz.
		If overvoltage is detected during regeneration, incoming AC line impedance may be too high.	Increase kVA rating of supply transformer to proper rating for drive size.
		Malfunctioning regeneration control circuit.	Replace Main Control Board (Gate Drive Board on A04/A06 drives).

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18	Bus Undervolt displayed - DC bus voltage less than the minimum allowable level was detected.	Incoming 3 phase voltage is out of tolerance.	Adjust taps on transformer or add step-up transformer to keep AC line voltage above 180V AC, 50/60 Hz.
		Incoming AC line impedance is too high.	Increase kVA rating of supply transformer to proper rating for drive size (especially if fault occurs during accel or when the motor is running under heavy load),.
		An incoming 3 phase line is open, or has high impedance.	With drive operating in motoring or accel (if possible), check phase to phase line voltages for balanced conditions and verify that voltage is above 180V AC. Check all incoming line connections for tightness.
19	AC Phase Loss displayed - Loss of one phase of incoming AC line detected by drive.	Refer to fault condition 4.	Refer to fault condition 4
		An incoming 3 phase line is open, or has high impedance.	With drive operating in motoring or accel (if possible), check phase to phase line voltages for balanced conditions. Check all incoming line connections for tightness. If a three-phase motor is connected to the AC line, a lost phase may not be detected by a voltage test on a lightly loaded 8510 system.
		Incoming AC line impedance is too high.	Increase kVA rating of supply transformer to proper rating for drive size. (Especially if fault occurs during accel or when the motor is running under heavy load.).
		Malfunctioning IGBT module in converter bridge.	Check IGBT modules M4, M5, and M6 (or IGBT2 in A04/A06 drive) according to procedure later in this chapter. Replace Power Unit if IGBT is malfunctioning.
		Malfunctioning printed circuit board.	Replace the Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06).
		Malfunctioning Power Unit.	If problems were not found with other tests, replace the Power Unit.
20	Motor Ovrtemp displayed - The drive detected that the thermal switch in the motor has opened.	Motor is overloaded by existing duty cycle.	When the motor cools, the thermal switch will close and the fault will clear. Reduce duty cycle loading or increase size of motor/drive system.
		Motor fan not operating.	<ol style="list-style-type: none"> 1. Measure voltage at fan terminal block in motor terminal box. If voltage not 200 to 230V AC when AC power is applied to the drive, check fuses FU2R, FU2S, and FU2T (on A22 drive only) and wiring to fan. 2. If voltage is present and fan is not operating, check for obstructions. Otherwise replace motor or cooling fan.

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Insufficient air flow through motor cooling passages.	Clean motor fan protective grill and fan. Use pressurized air to clean cooling passages in each corner of the motor frame.
Incorrect motor selected in MOTOR SELECT- Catalog Num parameter.	Check Catalog Num setting to verify that it matches the motor nameplate. Incorrect parameter setting or oversized drive can result in excitation currents that exceed motor rating.
Motor thermal switch or wiring (through resolver cable) has malfunctioned.	<ol style="list-style-type: none"> 1. Measure motor case temperature. Thermal switch should open at $140^{\circ} \pm 5^{\circ}\text{C}$. Case temperature should be in excess of 110°C at this time. 2. If motor case is below 110°C, use an ohmmeter to check the thermal switch. Approximately zero ohms should be measured between pins 15 & 16 on the resolver connector in 1327AB series motor terminal box. For 1327AD motors, measure pins 9 & 10. If an open circuit or high resistance is measured, replace the motor. 3. If thermal switch is OK, check cable to drive and connectors for proper connection and continuity. Repair or replace as required.
Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drive).

21	Drive Ovrtemp displayed - The drive detected that the thermal switch on the drive heat sink has opened.	Drive is overloaded by existing duty cycle.	When drive cools, the thermal switch will close and the fault will clear. Reduce duty cycle loading or increase size of motor/drive system.
		Drive cooling fan not operative.	Check fuses FU2R and FU2S. Verify that fan power cable is plugged into the Power Board. The A11 uses connector XB10 in top left corner of Power Board. The A22 uses connector XB9 in the upper right corner and XB10 in the lower right corner of the Power Board. If fuses OK and fans inserted, then cooling fan malfunctioning. Replace Power Unit.
		Insufficient air flow over heat sink or poor heat transfer.	Thoroughly clean the heat sink using pressurized air. Assure that there is sufficient clearance above and below heat sink to allow adequate air flow.
		Incorrect motor selected in MOTOR SELECT- Catalog Num parameter.	Check Catalog Num setting to verify that it matches the motor nameplate. Incorrect parameter setting can cause current oscillation that exceeds drive rating.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drive).

Spd Error Hi displayed - A motor stall condition or an unexpected motor acceleration or deceleration was detected.

If during startup, the motor runs at a constant low speed or reverses direction frequently, the motor versus resolver phasing is incorrect.

Use the parameter **PARAMETER SET - ELECT CONFIG - Motor Phasing** to reverse the relative phasing of the motor to the resolver.

Incorrect motor selected in **MOTOR SELECT- Catalog Num** parameter.

Check **Catalog Num** setting to verify that it matches the motor nameplate. Incorrect parameter setting can cause torque loss.

Load requires a torque that exceeds motor torque limit setting.

1. Change duty cycle to reduce required motor torque.
2. Turn **Low Torque Limit Select** input Off or increase setting of **Low Torq Lmt** parameter to allow sufficient torque to drive the load. Increase rating of motor/drive system if necessary to drive the load.

Motor phase is open.

Check all power wiring to the motor for continuity and tight connections. Use an ohmmeter to verify phase to phase continuity for each motor phase.

(When using 1327AD series dual winding motors) Malfunctioning winding change contactor.

Check the contactors to assure they are making proper connections at all times. Replace contactors if necessary.

Resolver or resolver wiring is malfunctioning.

Refer to fault condition 6 for solutions.

Malfunctioning Power Unit.

If problems were not found with other tests, replace Power Unit.

Malfunctioning printed circuit boards.

If problems were not found with other tests, replace Main Control Board (gate drive and CPU Boards on A04/A06 drives).

Mtr Windg Chg displayed - The auxiliary contacts on the winding change contactors did not cycle as expected during the winding change operation. Whenever the Motor Winding Select - Low/High input is Off, the auxiliary contact on the Low Speed Contactor should be closed. Whenever the Motor Winding Select - Low/High input is On, the auxiliary contact on the High Speed Contactor should be closed. This fault is monitored only when a 1327AD series dual winding motor has been selected with the **MOTOR SELECT - Catalog Num** parameter.

Interconnection problem between contactors.

1. Verify that connector CN1 is properly connected to the drive.
2. Verify that the connector CN1 and the contactors are correctly wired.
3. Check the cable for continuity.

One of the winding change contactors are malfunctioning.

Check the contactors to verify that they operate properly. Verify the operation of the auxiliary contacts.

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Malfunctioning printed circuit board.

If problems were not found with other tests, replace Main Control Board (Gate Drive Board and possibly CPU Board on A04/A06 drives).

Table 1.G
Problems that Occur during Spindle Orient Operation

No.	Problem	Probable Cause	Possible Solutions
24	Motor runs continuously at the Orient Speed parameter setting without faulting and without orienting.	Feedback device is incorrectly phased.	Use the ORIENT SETUP - FEEDBACK DEFN - Encdr Phasing parameter to reverse the phasing of the orient feedback device.
		Wrong type of feedback device has been specified.	The ORIENT SETUP - FEEDBACK DEFN - Encoder Type parameter must be set to "OPTICAL PULSE" when an optical encoder is used and to "MAGNET ANALOG" when the high resolution magnetic feedback is used. Change this parameter to the correct setting and store it in EEPROM by energizing the Drive Enable input. After the correct setting is stored, AC power must be removed from the drive and then reapplied to reset this parameter value in the drive control software.
		The number of encoder lines has been incorrectly programmed.	Use the ORIENT SETUP - FEEDBACK DEFN - Encoder Lines parameter to set the correct encoder line count or number of teeth on the high resolution feedback gear.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (CPU Board on A04/A06 drives).
25	The spindle over- shoots the target position and oscillates several times before stopping.	Either the velocity loop or the orient position loop is not tuned correctly.	Adjust SERVO MODE - HI SPD RANGE P and I gains to obtain quick stopping without overshoot when the Run command is energized/de-energized.
		The accel/decel ramp rate settings are too slow relative to the orient position loop settings.	The accel/decel ramp rate setting limits the decel rate that can be obtained during orient and a slow decel rate can cause overshoot. Reduce the value of the Acc Rate #1 or Acc Rate #2 parameter setting or select the quicker accel/decel rate setting.
		The orient mode tuning requires a faster decel rate than the drive can provide.	Reduce the value of the ORIENT TUNE - Orient Speed parameter setting or increase the value of the ORIENT TUNE - Orient Start parameter setting. As explained in the 8510 Programming Manual (publication 8510-5.2), these parameters control the orient position loop gain and define the required deceleration rate.

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26	Bad PG Marker displayed - A correct marker pulse was not detected within one revolution of the feedback device as determined by the programmed number of lines on the feedback device.	The number of encoder lines has been incorrectly programmed.	Use the ORIENT SETUP - FEEDBACK DEFN - Encoder Lines parameter to set the correct encoder line count or number of teeth on the high resolution feedback gear.
		Feedback device not correctly connected to the drive.	<ol style="list-style-type: none">1. Verify that connector CN2 is connected to the drive.2. Verify the wiring of the connector at the drive and at the feedback device.
		Malfunctioning feedback device.	<ol style="list-style-type: none">1. If an optical encoder is used, verify that the marker pulse is present and of proper amplitude and width relative to the A and B channel outputs.2. If the high resolution magnetic feedback is used, verify the output signals per Figure 1.4. Adjust the sensor relative to the gear to obtain proper signals or replace the sensor head.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (CPU Board on A04/A06 drives).
27	Bad PG Count displayed - An incorrect number of spindle position feedback counts was detected between two successive markers pulses as determined by the programmed number of lines on the feedback device.	The number of encoder lines has been incorrectly programmed.	Use the ORIENT SETUP - FEEDBACK DEFN - Encoder Lines parameter to set the correct encoder line count or number of teeth on the high resolution feedback gear.
		Feedback device is incorrectly phased.	Use the ORIENT SETUP - FEEDBACK DEFN - Encdr Phasing parameter to reverse the phasing of the orient feedback device.
		Feedback device not correctly connected to the drive	<ol style="list-style-type: none">1. Verify that connector CN2 is connected to the drive.2. Verify the wiring of the connector at the drive and at the feedback device.
		The ORIENT TUNE - Orient Start parameter value is much too low relative to the value of ORIENT TUNE - Orient Speed parameter.	Either increase the value of ORIENT TUNE - Orient Start or decrease the value of ORIENT TUNE - Orient Speed.
		Malfunctioning feedback device.	<ol style="list-style-type: none">1. If an optical encoder is used, verify that the A, B, and Z channel outputs are present and have proper amplitude/phase relationships and that the signals are relatively free of electrical noise.2. If the high resolution magnetic feedback is used, follow the procedure shown in Figure 1.4 to verify the output signals. Adjust the mounting of the gear and the position of the sensor relative to the gear to obtain proper signals or replace the sensor head.

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		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (CPU Board on A04/A06 drives).
28	Bad PG Output displayed - The electrical signals from the high resolution magnetic feedback device are abnormal.	Wrong type of feedback device has been specified.	If an optical encoder is being used, the ORIENT SETUP - FEEDBACK DEFN - Encoder Type parameter must be set to "OPTICAL PULSE". When this parameter is changed and then stored in EEPROM, AC power must be removed from the drive and then reapplied to reset this parameter value in the drive control software.
		The gear or sensor are not correctly installed.	The gear and sensor must be installed in accordance with the mechanical tolerance specifications in the High Resolution Magnetic Feedback Instructions (8510-5.13). At test point A on the Main Control Board (CPU Board of A04/A06 drive), the amplitude modulation of the signal should be less than 0.1 volts when the gear is properly installed. The magnitude of the signal can be changed by changing the gear to sensor airgap.
		Interconnecting cable or sensor are defective.	<ol style="list-style-type: none"> 1. Verify that proper signals are received from the sensor. See Figure 1.4 for correct waveforms. 2. If not correct, check cables and connectors for continuity and proper connections. 3. If cables and connections are OK, replace sensor.
		Malfunctioning printed circuit board.	If problems were not found with other tests, replace Main Control Board (CPU Board on A04/A06 drives).

Table 1.H
Other Faults that Indicate Control Hardware Malfunction

No.	Problem	Probable Cause	Possible Solutions
29	Main RAM Err displayed - A parity or functional error was detected in RAM on the Main Control Board (CPU Board on A04/A06 drive).	RAM is malfunctioning.	Replace Main Control Board (CPU Board on A04/A06 drive).
30	I/O Comm Err displayed - No communications occurring between microprocessor on Main Control Board (CPU Board on A04/A06 drive) and microprocessor on I/O Board.	Hardware malfunction on either I/O Board or Main Control Board (CPU Board on A04/A06 drive).	<ol style="list-style-type: none"> 1. Verify that EPROMs on both the I/O Board and Main Control Board are inserted correctly. 2. Verify that the I/O Board connectors are fully seated into the Main Control Board (or CPU Board) connectors. 3. If problem remains, replace I/O Board 4. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive).

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31	Main CPU Loss displayed - CPU on Main Control Board (CPU Board on A04/A06 drive) unable to complete calculations during allotted time cycle.	Firmware problem or hardware malfunction on Main Control Board (CPU Board on A04/A06 drive).	<ol style="list-style-type: none"> 1. Verify that the EPROM on the Main Control Board is inserted correctly. 2. If problem remains, replace Main Control Board (CPU Board on 3. If problem remains, contact factory.
32	Main Comm Err displayed - No communications occurring between master and slave processors on Main Control Board (CPU Board on A04/A06 drive).	Hardware malfunction.	<ol style="list-style-type: none"> 1. Verify that the EPROM on the Main Control Board is inserted correctly. 2. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive)
33	Main Watchdog displayed - The watchdog timer on the Main Control Board (CPU Board On A04/A06 drive) tripped out.	The microprocessor on Main Control Board ran out of execution time or stopped.	<ol style="list-style-type: none"> 1. Verify that EPROMs on both the I/O Board and the Main Control Board (CPU Board on A04/A06 drive) are inserted correctly. 2 If problem remains replace Main Control Board. 3. If problem recurs, contact factory.
34	Main A/D Conv displayed - The A/D converter on the main control board (CPU Board on A04/A06 drive) faulted or sensed excessive offset.	Hardware malfunction.	Replace Main Control Board (CPU Board on A04/A06 drive).
35	Main CPU1 Err displayed - The master cpu on the Main Control Board (CPU Board on A04/A06 drive) malfunctioned.	Hardware malfunction.	<ol style="list-style-type: none"> 1. Verify that EPROM chip on Main Control Board (CPU Board on A04/A06 drive) is inserted correctly. 2. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive).
36	Main CPU2 Err displayed - The slave cpu on the Main Control Board (CPU Board on A04/A06 drive) malfunctioned.	Hardware malfunction.	<ol style="list-style-type: none"> 1. Verify that EPROM chip on Main Control Board (CPU Board on A04/A06 drive) is inserted correctly. 2. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive).
37	Main RAM Init displayed- Functional error detected in RAM on Main Control Board (CPU Board on A04/A06 drive).	Hardware malfunction.	Replace Main Control Board (CPU Board on A04/A06 drive).
38	Main CPU Ovfl displayed - CPU on Main Control Board (CPU Board on A04/A06 drive). ran out of execution time.	Firmware error or hardware malfunction.	<ol style="list-style-type: none"> 1. Verify that both EPROMs on I/O Board and Main Control Board are inserted correctly. 2. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive). If problem recurs, contact Allen-Bradley.

continued...

39	Optical Intpt displayed - A system interrupt was sensed system fiber optic transducer.	Bright flash of light triggered the fiber optic input.	<ol style="list-style-type: none"> 1. Assure that the rubber plug is installed in the fiber optic connector on the Main Control Board (CPU Board on A04/A06 drive). The fiber optic connector is located adjacent to connector CN2. 2. If problem remains, replace Main Control Board (CPU Board on A04/A06 drive).
40	Hi Accel Rate displayed	Firmware error.	Reset drive. If fault persists, contact Allen-Bradley.
41	Hi Positn Cmd displayed	Firmware error.	Reset drive. If fault persists, contact Allen-Bradley.
42	Hi Positn Err displayed	Firmware error.	Reset drive. If fault persists, contact Allen-Bradley.
43	Hi Speed Cmd displayed	Firmware error.	Reset drive. If fault persists, contact Allen-Bradley.

I/O Board Faults

When problems occur with the I/O Board, the first line of the display will show either !Fault I/O Board or Warning I/O Brd. The second line provides more detailed information about the exact nature of the fault.

Table 1.I
Problems Specifically Related to the I/O Board

No.	Problem	Probable Cause	Possible Solutions
44	EEPROM No Data displayed - The I/O Board microprocessor could not find the EEPROM.	The drive was not programmed.	Perform the complete drive setup programming procedure as described in the 8510 Programming Manual (publication 8510-5.2).
		EEPROM not properly installed or malfunctioning.	Verify that the EEPROM is properly installed in the socket. If problem remains, replace I/O Board.
45	Bad EEPROM displayed - The I/O Board microprocessor can not communicate with the EEPROM.	EEPROM not properly installed or malfunctioning.	Verify that the EEPROM is properly installed in the socket. If problem remains, replace I/O Board.
46	Bad Optional A/D displayed- The I/O Board microprocessor can not communicate with or is receiving bad data from the optional A/D converter on the I/O Board.	This version of the I/O Board does not have the optional 14 bit linear A/D converter installed.	If the drive catalog number does not end in either -Cx or -Dx, the optional A/D converter is not installed. Either program drive to use standard A/D converter or install I/O Board that includes the optional A/D converter.
		Malfunctioning A/D converter or I/O Board.	Replace I/O Board.

continued...

47	EEPROM Sumchk displayed - The I/O Board microprocessor has read an incorrect check sum value from the EEPROM which indicates corrupted data in the EEPROM.	Data has become corrupted due to noise or some other means. EEPROM is malfunctioning.	Perform the complete drive setup programming procedure as described in the 8510 Programming Manual (publication 8510-5.2). Replace the EEPROM or complete I/O Board.
48	H8 CPU RAM displayed - The RAM that is internal to the H8 microprocessor will not pass a read/write test.	The microprocessor on the I/O Board is malfunctioning.	Replace I/O Board.
49	I/O DURM displayed - The dual-port RAM used to communicate to the Main Control Board will not pass a read/write test.	The dual-port RAM on the I/O Board is malfunctioning.	Replace I/O Board.
50	LCD Timeout displayed - Communications between the I/O Board microprocessor and the programming display module did not occur in the allowed time.	The I/O Board is malfunctioning.	Replace I/O Board.
51	Any other !Fault I/O Board fault message displayed - Indication of firmware or hardware malfunction on I/O Board.	Some hardware or firmware on the I/O Board is malfunctioning.	Replace the I/O Board.

Table 1.J
Problems Caused by Programming Errors

No.	Problem	Probable Cause	Possible Solutions
52	Bad Comb M & D displayed - The motor and drive catalog numbers that are selected are not compatible with one another.	For the gear range selected, the MOTOR SELECT- Catalog Num and the ELECT CONFIG - Drive Cat Num parameter values not compatible or are not defined.	Verify that motor and drive catalog numbers have been programmed for the selected gear range. Verify that the selected motor and drive catalog numbers are a compatible set. A 5.5 kW drive can be used with any motor rated 5.5 kW or smaller. An 11 kW drive can be used with any motor rated from 5.5 kW through 11 kW. A 22 kW drive can be used with any motor rated from 11 kW through 22 kW.
53	Max Spd None displayed - The microprocessor can not find a value programmed for the SPINDL PRESET - Overspd Trip parameter.	For the gear range selected, the value for the SPINDL PRESET- Overspd Trip parameter is set to zero.	Verify that the SPINDL PRESET - Overspd Trip parameter is set to a value other than zero.

continued...

54	Op Dig Set Er displayed - The drive has been programmed to use the optional 16 bit parallel inputs for two different functions simultaneously.	For the gear range selected, the SPINDLE MODE - Cmnd Source parameter has been set to either "4 DIGIT BCD" or "16 BIT BINARY" and the ORIENT TUNE - Position Data parameter has been set to either "BCD INPUT" or "BINARY INPUT."	Within a given gear range, the optional 16 bit digital command input can be used as either a spindle speed command or as an orient position command, not both. Verify that only one of these functions are programmed for the BCD or binary command input.
55	Orient Prm Er displayed - One or more of the critical parameters for orient are not properly programmed.	For the gear range selected, one or more of the following parameters has a programmed value of zero: SET RATIOS - Spindle Revs; SET RATIOS-Motor Revs; ORIENT TUNE - Orient Speed; ORIENT TUNE - Orient Start.	Verify that each of the parameters listed under Probable Cause is set to a valid value that must be greater than zero.
56	Sp Mtr 1 P Er displayed - An error was detected in the motor parameter table values.	For the gear range selected, the motor type selected by the MOTOR SELECT- Catalog Num parameter has been set to "NON-STD MTR 1" and this motor has not been defined or is incorrectly defined.	Change the MOTOR SELECT - Catalog Num parameter setting to the correct catalog number for the motor connected to the system. If this does not correct the problem, contact the factory.
57	Sp Mtr 2 P Er displayed - An error was detected in the motor parameter table values.	For the gear range selected, the motor type selected by the MOTOR SELECT- Catalog Num parameter has been set "NON-STD MTR 2" and this motor has not been defined or is incorrectly defined.	Change the MOTOR SELECT - Catalog Num parameter setting to the correct catalog number for the motor connected to the system. If this does not correct the problem, contact the factory.

Figure 1.3
Resolver Signals

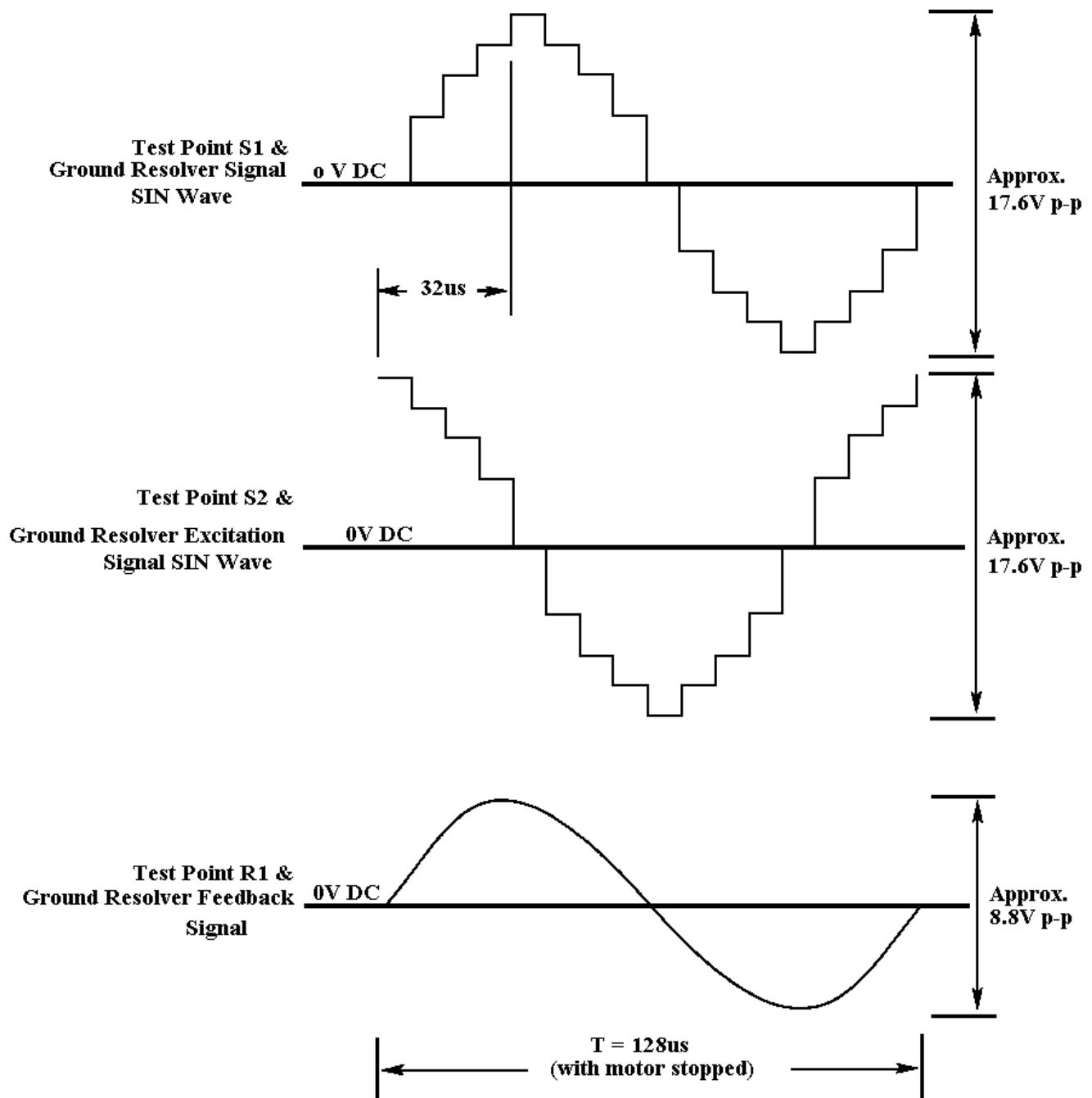
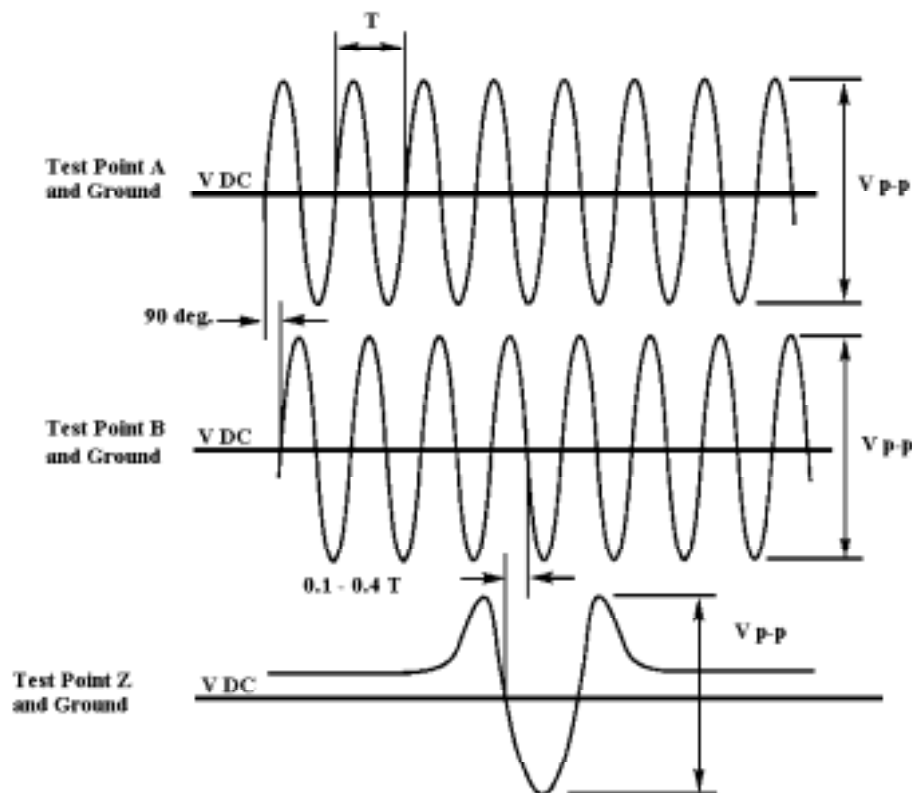


Figure 1.4
High Resolution Magnetic Feedback Signals



T depends on the number of gear teeth and gear speed.

$$T = \frac{1}{N \times 1/60 \times S}$$

where:

N =Number of Teeth

S =Speed (rpm)

Amplitude of A/B:

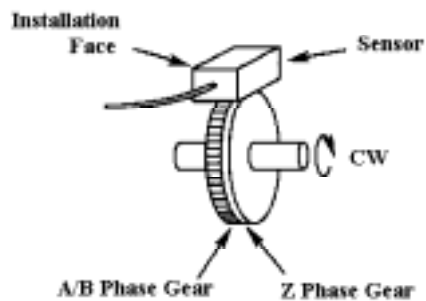
$V_{DC} \approx 2.5V$

$V_{p-p} = 3V$

Amplitude of Z:

$V_{DC} \approx 2.5V$

$V_{p-p} = 3V$



Install the gear and sensor as shown. The Specifications above should be set at CW rotation when the gear is viewed from the Z phase gear side.